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STRATEGIC IMPLICATIONS OF SPACE-BASED LASERS

OCTOBER 1981

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I. INTRODUCTION

The strategic environment, which until recently was strong because of the relatively stable and bipolar military balance between the United States and the Soviet Union, is now increasingly complicated, containing diverse but mutually influential economic, political, technological and military factors. In order to deal with this evolution we must understand both the present and future impact of these factors. Certain growing infant technologies such as exploitation of space require an imaginative approach to speculative concepts. That imagination may be enhanced both by technology and by its impacts on the world order.

Dealing with these changes will require that we develop new ways of measuring and assessing military power, new ways of evaluating the strategic balance, and new tests and criteria for determining which balances remain acceptable to us. These new techniques must be sensitive to those economic, political and technological factors which help to shape this new environment as much as or more than military capabilities.

High-energy laser (HEL) technology applied in space could present opportunities for initiating dramatic changes in the strategic order. The incipient technology available for space-based lasers (SBLs) and the missions they could accomplish might change the nature of strategic competition and the levels and perceptions of strategic balance, particularly when that technology is integrated with other uses of space. These factors and other proposed uses of space for active military purposes require an understanding of the strategic and political contexts of space as well as essential legal or technical approaches to it that have been prevalent in Washington to date.

Initial evaluation of the strategic significance of space lasers must include:

- A review of the present and future political-strategic contexts for SBL deployments in relation to the U.S./USSR strategic balance.
- A review of possible strategic impacts of SBLs, including roles, missions and goals.
- A scenario-based review of specific major mission areas for SBL employment and an evaluation of their impact.

The remainder of this report is devoted to three tasks.

II. THE POLITICAL-STRATEGIC CONTEXT FOR SBL DEPLOYMENTS: 1980-2000

1. BACKGROUND

Because of the long lead times associated with SBL development and deployment, a changed political-strategic environment will exist by the time such deployments occur. In order to establish and characterize the possible impacts such future deployments could have, we need to (1) characterize the present environment, emphasizing U.S. and Soviet perspectives; (2) describe that future environment consonant with predicted deployment times for SBLs; and then (3) assess the impact of SBLs on that environment. The last objective is important because the efforts to meet the military and political challenges of the future, whether with SBLs or through other means, will influence that environment.

The characterization of the political-strategic context in which deployments of HELs might occur is a complex and formidable undertaking, based on limited data, inferences, and attempts to rationalize or "model" decision-making processes. Traditional methodologies are often poorly suited for assessing the impact of dynamic changes on the political-strategic environment.

Underlying the political-strategic assessments in the 1960s and 1970s was a sense that the basic U.S.-Soviet strategic relationship was essentially static and that the balance flowing from that interaction was only modestly dynamic. Political-strategic assessments were required to forecast circumstances and outcomes according to "parity," "equivalence," and "countervailing" power, each of which implied dynamic interaction, but to which only static values were ascribed. Theoretically, once both sides acquired a secure retaliatory capability, or at the very least attainment of essential parity, the freezing of the strategic balance and paralysis of arms race behavior would

lead to stabilization of the U.S.-Soviet political relationship. Carried to the extreme, this point of view encouraged a mistaken notion that both sides harbored a fundamental commonality of interests arising from parallel security concerns for stability.

As a result, intelligence assessments of Soviet building trends until recently generally had failed to capture the scope and intensity of changes in force posture or to predict adequately dynamic changes in strategy. These assessments also tended to ignore or to underestimate the role of long-standing doctrinal and strategic principles as a determinant of Soviet military activity. Even where accurate, such estimations and analyses tended to focus on static or simple dynamic military indicators; that is, on those things most amenable to quantification.

Deterrence concepts are based both on assessments of the opponent's value calculus and on his likely response to threats to his values. However, because such a calculus involves variables and objectives which are constantly shifting, it is virtually impossible to determine with certainty that which will deter an opponent under all circumstances. The process whereby the United States seeks to maintain the strategic values of its military forces must therefore be dynamic; it is bound to change with circumstances and with the relative capabilities of both sides. The United States must also attempt to understand the way in which its own defense policies and force deployments affect Soviet perceptions and plans.

Political balances are often more a function of perceptions than of quantifiable factors. Estimates of a nation's capability for action alone are insufficient; there must also exist a perception of a will to act. What seems most important to public awareness of political balances is the perception of trends and their interpretation. Growth in

the disunity of the NATO alliance, in the intervention and presence of the Soviet bloc in South Asia and Africa, and in the coercive capacity of Third World raw-material-producing groups exemplify trends which influence and are influenced by assessments of political balances. It may be extremely difficult to reverse such trend perceptions. What may be required is a shock effect; a gradual or measured response may require a degree of sophistication beyond most observers.

Some observers have suggested that the character of the political-strategic context has shifted radically over the past decade, and that it will come to be dominated by political and economic balances rather than military and strategic ones. One "school" argues that a set of "new forces" has emerged in international relations which will constitute the decisive elements in future political and economic balances. It is asserted that radical nationalism and the rise of non-Marxist ideological and religious groups have reduced the importance of traditional political values and relationships. These new authoritarian regimes are less amenable to influence via traditional mechanisms; their ability to resist traditional military pressures is heightened. Where outside factors impinge on national behavior they tend, according to this school, to be economic and technological.

Economic power and prosperity can be a major force in international politics (e.g., Japan). The drive in the Third World for control over national resources and for a restructuring of the prevailing international economic order has made economic relations the central feature of this new political-strategic context. Military and strategic policies increasingly revolve around economic and trade considerations; U.S. policy in the Middle East since 1973 is the clearest example of the change in the context. The ability of so many nations to influence international behavior through the manipulation of political

and economic resources is also believed to have reduced the influence of military force as an instrument of international relations. The "new forces" school suggests that military force is increasingly inappropriate and inapplicable.

However, military power has been and will continue to be one of the most significant influences on assessments of the political-strategic context. Military power provides perhaps the least ambiguous means of demonstrating national objectives, intent and will. It is the most readily perceivable. It is amenable to quantification as well as qualitative characterization at many levels. Equally undeniable is the role that power can play in influencing the political perceptions of other nations. This has been particularly true in the acquisition of revolutionary military technologies; witness the impact of Sputnik on global perceptions of the status of the Soviet Union. A nuclear weapon capability confers a similar special status on its possessor.

Relations between the United States and the Soviet Union are still defined almost exclusively by the character and limitations of the military balance. Strategic issues and balance measurements continue to exert the most profound influence on the behavior of both sides. Avoidance of direct conflict, and particularly nuclear war, will continue to be central to superpower relations and the policies of the two blocs. However, war avoidance does not negate the political utility of military capabilities in U.S. policy towards the Soviet Union. A strong military posture and demonstration of U.S. will to deny the Soviet Union a favorable balance of power may be the single most effective means of insuring stability. In view of the global character of U.S. national interests, a restrictive military balance, one which favors the Soviet Union or inhibits U.S. flexibility and initiative, is clearly unacceptable.

2. THE CURRENT POLITICAL-STRATEGIC CONTEXT

The current political-strategic context is one of increasing U.S. strategic uncertainty coupled with an awareness of political-economic vulnerability. The Soviet attainment of strategic "parity" has been accompanied by growth in their theater nuclear, naval and conventional military capabilities which threaten both U.S. and allied interests. At the same time, traditional alliance relationships are increasingly strained. The United States and its European allies have disagreed more and more about the character of NATO defense and amount of defense obligations, the extent of appropriate responses to Soviet global expansionism, and global economic issues.

Globally, the United States and the West are faced with growing instability, military conflicts, and the rise of radical regimes interested in changes in the prevailing international order. Proliferating military capabilities, often acquired from the West, would complicate the U.S. and allied use of military force in response to Third World problems.

The United States has shown both a reluctance and a certain inability to respond effectively to this increasingly precarious situation. In part, this stems from the traditional role of the United States as the status quo or defensive power in an essentially bipolar world. U.S. policy has tended to be reactive rather than dynamic, seeking to minimize changes to the political-strategic context. The efforts to institutionalize conflicts assume that a consensus exists on basic values and that conflict can be limited to acceptable levels and forms. This has been reflected particularly in U.S. arms control policy, which has sought to isolate the strategic relationship from the rest of U.S.-Soviet interactions on the assumption that the two powers shared similar core values on nuclear deterrence and national security.

U.S. defense policy remains committed to the maintenance of the Triad, first to ensure adequate surviving retaliatory capability, and second, in order to provide a measure of flexibility and controllability in a nuclear conflict; long-term endurance has been considered to be less important than immediate response capability. U.S. forces have neither been postured for a protracted engagement nor adequately configured or targeted for nuclear warfighting. The command, control and communications (C³) infrastructure which supports U.S. forces is ill-suited for more than a short-term, spasmodic response; it is highly vulnerable to interruption.

Current efforts to modernize or reconfigure U.S. strategic forces focus almost exclusively on systems improvement rather than on fundamentally new or different capabilities. No major efforts have as yet been undertaken to improve the long-term warfighting capability of U.S. forces.

For more than a decade, U.S. political-strategic policy was based on the belief that strategic stability could be manufactured by retaining existing strategy and by relying on arms control agreements. Even where force posture upgrades were suggested, they tended to support existing doctrine. The United States has avoided a commitment to active defense, except in extremely circumscribed areas, arguing that such a change in policy would be strategically destabilizing and politically provocative, and that it would threaten the interests of both sides in achieving stability through relatively symmetrical strategic capabilities. Despite significant disparities between the strategic postures and nuclear doctrines of the two sides, some observers still have emphasized the common features and viewed Soviet force posture changes in a "mirror-image" of our own retaliation-oriented, stability-through-deterrence approach.

The current parlous military environment and the growing array of Soviet strategic, theater, and conventional capabilities is unlikely to lead either to a stable military relationship or to significant progress in arms control. While agreements are possible, they are likely to be different from those initially envisioned when U.S.-Soviet arms control first became a process. Furthermore, recent U.S. efforts to link Soviet behavior to further progress in arms control may weaken Soviet interest in arms limitations; such a U.S. policy strikes at the heart of the Soviet strategy of peaceful coexistence--the divisibility of Soviet actions in different spheres. Furthermore, the United States appears to be moving away from the idea that military and political issues can be decoupled, that military capabilities have little or no political significance, and that strategic arms control can be isolated from U.S.-Soviet global interactions.

3. THE CURRENT SOVIET POLITICAL-STRATEGIC POSTURE

Perhaps more than the U.S. view, the Soviet world view emphasizes the dynamic interaction of political-strategic factors. The doctrinally derived sense of the positive movement of historical forces is reinforced by the postwar experience of the current generation of leaders. The current Soviet strategy of peaceful coexistence reaffirms traditional Marxist/Leninist principles. The class/national liberation struggle can be encouraged and protected because imperialist counter-revolution is neutralized by the military power of the Soviet Union. U.S. willingness to enter into a relationship requiring a recognition of the principle of Soviet strategic and political equality legitimized peaceful coexistence as the basis for superpower relations. The Soviets viewed the Strategic Arms Limitation Talks (SALT) as inhibiting the United States from responding to Soviet and Soviet-backed activities in the Third World. Soviet efforts to protect the SALT-derived superpower

relationship came from the need to ensure the continuation of the current form of competition between the systems, and to limit the ability of the West to shift either the arena or level of conflict to regions or mechanisms more suitable to Western capabilities and interests.

The essence of Soviet military strategy rests on possession of effective warfighting capabilities. Although the ability to field a secure retaliatory capability significantly reduces the likelihood of nuclear war, it does not eliminate the possibility entirely. In the event of war, the Soviet Union must therefore be able to survive a nuclear attack and defeat an opponent. The concept of pre-emptive counterforce, so central to the Soviet warfighting strategy, is a response to the survival imperative. The Soviet Union refuses to base its security solely on an ability to deter an adversary via purely retaliatory capability.

In the event of war, the Soviet Union is committed to victory. The threat posed by capitalist use of nuclear weapons is judged too severe to warrant total reliance on intrawar negotiations or escalation control. In the Soviet view, the West, even in an initially conventional conflict, eventually will use nuclear weapons to offset Soviet conventional advantage or to attempt to redress postwar political-strategic inferiority. Hence, while a conventional phase is posited in some scenarios, Soviet doctrine views escalation as inevitable. Given the threat, as they view it, warfighting and war winning appear to be reasonably prudent courses of action.

Complementing Soviet offensive efforts at damage limitation is an array of defensive capabilities designed to act synergistically to further degrade an opponent's strikes. Unlike the United States, which has sometimes viewed defenses as destabilizing and of marginal utility, the Soviet Union views such

measures as necessarily prudent. While recognizing the limited effectiveness of existing defensive capabilities to mitigate the effects of a massive nuclear strike, Soviet military planning sees such capabilities as increasing an attacker's uncertainty.

Soviet arms control policies are generally tailored to fit the requirements of military doctrine and strategy. The Western concept of strategic stability has little or no corollary in Soviet thinking. Rather, the Soviets regard arms control as a means of freezing the strategic competition in a manner favorable to Soviet strategy and related force posture. This was the central policy underlying Soviet pursuit of limitations of ABM in SALT I: exchanging high ceilings on offensive systems in which the Soviet Union had a reasonable chance of competing effectively with the United States for restriction on defenses in which the United States held a clear technological advantage. The constancy of Soviet military planning, long tenure in office for key decision-makers, a long-range weapons-acquisition process, and the lack of a powerful institutionalized advocate for arms limitation permit orchestration of arms control policy.

The Soviet leadership views military power, including strategic forces, as valuable political capital serving to secure Soviet superpower status; to offset external military threats and internal vulnerabilities and difficulties; and to provide a political-strategic umbrella under which the Soviet Union and its clients and allies can pursue the national liberation struggle. Soviet political success has essentially been earned by force or threat of arms. The political utility of military forces is reflected in increased Soviet willingness to commit its forces overseas, either directly or in support of clients, and to encourage the acts of proxy states, with

the expectation either that the West is deterred from responding or that Soviet power is sufficient to negate any countervailing activities. The high and increasing level of investment in conventional, theater nuclear, and intervention capabilities reflects Soviet confidence in the role of military force in nonsuperpower contingencies.

There are significant parallels in current Soviet defense policy with the U.S. military posture of the late 1950s and early 1960s. In both cases, military capabilities were sought for every conflict level. The neutralization of strategic capabilities implicit in the declaration of relative U.S.-Soviet parity may only have served to exaggerate Soviet interest in acquiring other military capabilities and widening those areas where the Soviet Union enjoyed superiority. Such capabilities more than incidentally serve to protect and further Soviet global interest under conditions of growing political-military instability.

Although it is fashionable to interpret Soviet difficulties as in some manner mitigating the potential threat posed by a massive military machine, such efforts neglect the central role played by military power in Soviet foreign policy. Rather than inhibit Soviet militancy or adventurism, domestic frustrations may provoke a hostile nationalist foreign policy. When it perceives a threat stemming from internal inadequacies, the Soviet leadership may find itself compelled to search for an external threat source and, having naturally identified that threat as the West, strike out at the perceived danger.

4. THE FUTURE CONTEXT: CHANGES IN THE POLITICAL-STRATEGIC ENVIRONMENT

Learned articles and pious hopes to the contrary, the U.S.-Soviet military-strategic competition likely will be the central issue in the political-strategic context of the 1990s.

Without the introduction of truly revolutionary technologies, the strategic balance will remain approximately "equivalent," although U.S. advantages might continue to be eroded in the absence of intense competition. However, the military-strategic competition can be expected to increase as the Soviet Union improves its capabilities to intervene on a global basis and to challenge the ability of the United States to exercise sea control over vital waters. The United States may be unable to deny Soviet access to or deter intervention in some regions.

The absence of any effective international order and the growing instability in the Third World increases the likelihood that the United States may find itself required to project power into distant regions. Without adequate overseas basing, the United States will be forced to meet intervention contingencies with CONUS-based forces; the ability to deploy intervention forces will be increasingly constrained and threatened by a growing Soviet capacity for interdiction. Even where adequate bases are available, regional deployments and allied capabilities will be vulnerable to Soviet attack.

Long-range strike assets will provide the Soviet Union with an improved ability to launch from homeland bases. Any direct U.S. response would be counterbalanced by the probability of escalation. Recent Soviet efforts at power projection in the Middle East, South Asia, and East Africa have shown an improving capability to shift assets within the Soviet Union in support of external operations. As a result, the United States will continue to face the problem of managing a finite set of military resources in a manner that will allow it to respond to one set of widely spaced contingencies (e.g., Europe, Southwest Asia) against an adversary with the advantage of interior lines of communication.

In view of growing Soviet power projection capabilities and the advent of a variety of radical, anti-Western regimes, the United States will likely develop an increased capability to deploy conventional and possibly even theater nuclear forces. Such a shift in policy will involve both the expansion of current naval force levels and the development of a series of overseas bases, particularly along the Arabian Sea, the Indian Ocean and the Persian Gulf littoral.

A significant factor affecting the political-strategic context of the 1990s will be the dynamic role of military power as an instrument of policy. This is particularly true for deployable military assets. Military power must be seen in order for its full weight to have political benefits. Demonstrations of military capability also bespeak the will to use force. Soviet deployments of increasingly sophisticated military technology, often comparable to that of the United States, are a reminder of Soviet superpower status and a constant impetus for accommodation by Western nations fearful of the power. The shift in the strategic balance over the past decade, and increasing U.S. and allied vulnerability, are now recognized to have had profound political repercussions. Therefore, it is likely that the future political-strategic environment will be one of political wariness and increasing military competition.

Current options and suggested approaches for the United States to redress the strategic balance fall essentially under the heading of "fixes." Proposed changes focus either on changes in the current Triad force mix or in their employment, i.e., in targeting policy. Foremost among the proposed "fixes" are changes in the character of land-based strategic forces, particularly the ICBM leg. Unless serious efforts are undertaken to increase the survivability of the ICBM, its role may eventually be decreased in favor of manned aircraft, multiple

platform-based cruise missiles, sea-based weapons, or a combination of the three. Changes in employment or targeting policies constitute relatively low-cost but also low-value "fixes" which will have little or no impact on perceptions or the political utility of U.S. strategic power. Failure to adequately upgrade U.S. strategic forces or to redefine their missions will probably result in the steady movement towards a minimum deterrence posture. Without significant changes, this result will be forced on the United States by the continual upgrading of Soviet offensive and defensive capabilities.

The driving feature of the future political-strategic environment will be possible changes in U.S. strategic policy and its objectives, most notably a movement towards either a strategy of warfighting and war survival or of mutual survivability. Warfighting requires reconfiguration of U.S. strategic and theater nuclear forces as well as major changes in support capabilities to insure the ability to function in trans-attack and post-attack environments. Strategic forces must be made survivable and usable throughout the course of a strategic engagement. Warfighting also implies a set of orderly and phased military and political objectives. This contrasts with the current policy which emphasizes sheer destructiveness and degree of pain inflicted.

Warfighting and war survival both may require that some essential national assets, including population, be defended, thus necessitating a new emphasis on strategic defenses. At a minimum, a warfighting approach suggests a reversal of the current policy emphasis on intrawar bargaining and escalation control. While political objectives could be articulated based on extant conditions, the minimum military objectives would be the defeat of the Soviet military and possibly the destruction of critical war-making capabilities.

Mutual survivability differs in several respects from a warfighting strategy. The latter posits a clear statement of the minimum victory conditions (i.e., the destruction of hostile military capabilities), while survivability is essentially a denial strategy. Changes in the present offensive force posture would not be as extensive and would primarily involve survivability upgrades. What would be required is a set of interlocking defenses offering a high-confidence probability of damage denial. Ballistic missile defense (BMD) would be a key component of a survivability force posture. Another component would be a nationwide program for civil defense and industrial hardening. The United States would then be left with relatively greater flexibility in responding to a Soviet strategic attack. The possibilities for restraint would increase commensurate with the improvement in survivability.

Movement toward both warfighting and survivability is to some degree a function of improvements in the effectiveness of defensive technologies. Offensive technologies are fast reaching a point where the value of marginal improvements is no longer cost-effective. While quantitative changes in offensive force postures are a virtual certainty, dynamic and lasting gains may be most likely through judicious exploitation of potentially significant defensive capabilities. Clearly, the current disparity between offense and defense can be narrowed. This is particularly true in the area of BMD. Improvements in sensors and guidance technologies, hypervelocity missiles, multiple-warhead vehicles, and nonnuclear kill mechanisms all provide potential for a credible BMD capability.

Some observers have predicted that in the 1980s the Soviets will markedly shift their investment in military research, development, and deployments away from strategic and theater offense and towards defense. It is likely that BMD will first

be used to defend existing strategic assets. The hardness of some offensive systems makes them less sensitive to leakage than softer targets.

The movement towards defense appears open-ended. Once initial deployments are achieved, even for the protection of strategic offensive assets, it is likely that basic programs will be expanded to increase coverage. While it is possible that preclusive security will not be attainable, a comprehensive program of active and passive defenses could achieve a pronounced reduction in the potential damage from nuclear threats. A panoply of defensive measures, such as a layered defense, would increase total system coverage while reducing the burden on any single element. Each step probably will be a logical progression from the preceding deployment. Thus, limited defense of counterforce capabilities is likely to expand to a limited regional or even nationwide coverage. Civil defense for populations and industrial protection would be the next step, to be followed by improved air defenses. Exploitation of defensive possibilities could possibly lead to a "defense race." The acceptance of such a possibility will require a more dynamic vision of the concept of strategic stability, one in which stable and "static" are not viewed as being synonymous.

It has been suggested that the Soviet Union itself might abrogate the current ABM agreement once it feels confident of its ability to pre-empt or at least compete effectively with the United States in BMD deployments. The possibility of military breakout or technological breakthrough must therefore be considered. The impact of a Soviet breakout through a rapidly deployable nationwide ABM capability, or a technological breakthrough resulting in first deployment of a SBL capability, could be enormous.

Unlike Sputnik, which was launched during a period of profound Soviet strategic inferiority, a new breakout/breakthrough would occur after two decades of intense Soviet military buildup. In light of other Soviet military capabilities, even a relatively low-effectiveness system could prove difficult to challenge. In this context, breakout would be an effort to gain strategic advantage over the opponent. While exploitation of a technological breakthrough, especially one which does not require the abrogation of treaty commitments, would be a more ambiguous threat, the prevailing strategic balance would not permit the United States to leave such Soviet initiatives unchallenged.

III. APPROACHES TO ASSESSING THE HIGH-ENERGY SBL

A conscious and coherent framework for SBL systems would help to clarify thought and analysis since the subject raises many dynamic unknowns; this would allow the different issues involved to be integrated and a focus on the most important goals and consequences to be maintained. Such an approach to SBLs will require an integrating but not prematurely constraining analytic view of SBL operations, an emphasis on the potential key impacts of SBL, and a sense of the strategic context and of the potential SBL role therein.

1. ANALYTIC APPROACH

The potential of the SBL is "awesome," according to an Aviation Week description of a Defense Department draft report (Ref. 1). Press reports of the Department of Defense draft study characterize the SBL emphatically enough to underscore the significance of the emerging space picture; but at the same time, they provide no concrete basis for detailed programmatic or policy choices about SBL development. That will continue to be intensely debated. The choice of an analytic approach to these decisions should combine coherence and comprehensiveness so that the potential of this new weapon will not be underrated as well-known types of strategic and program analysis tend to do with new systems and technologies.

The SBL has the potential to affect the fundamental strategic perceptions of the United States and the Soviet Union. However, these perceptions may not be precisely correlated with readily defined mission areas or systems capabilities. Responses to SBLs could be driven by a scientific-technological momentum even in the absence of a clear operational objective for the emerging capability. Continual review of the strategic direction of SBL development may be necessary to maximize its favorable impacts on the relevant and important balances of concern.

Given the vast potential benefits and natural uncertainties of SBLs, the danger exists that "SBL strategic analysis" could be confined to relatively well-defined technical issues. Alternatively, SBL analysis could be channeled within currently dominant and sanctified doctrines concerning strategic stability; one could assume that technology will catch up with or be confined by current policy goals. Neither of these approaches is likely to resolve the debate over the potential value of SBL. The limited knowledge of how SBL will actually be exploited combined with the extremely versatile potentials of SBL suggests that SBL analysis needs a more extended, general development than either of the two well-understood approaches can provide.

Given the early state of SBL understanding, abstract analysis of isolated technical aspects of SBL is likely to generate numerous, perhaps fatal, constraints on SBL development. Alternative results, however, may come from evaluating technical issues in the context of specific missions in which SBL could participate. Therefore, SBL can be evaluated for how it would interact with and possibly reduce constraints on other forces.

Deployment of SBL would undoubtedly help to redefine the importance and priorities of operations and missions from the way they are currently viewed. Such a potential should give SBL development an immediate impact on the strategic relationship since changes will be produced, even if they cannot be definitively characterized today. It is important, therefore, that studies not only analyze the effectiveness of SBL operations in various mission areas, but recognize the effects that the prospect of SBL may have in fundamentally altering the character or importance of those operations. Program planning as well as policy analysis in the case of fundamentally revolutionary technologies and capabilities could benefit from

a bias toward broad rather than narrow technical optimization, consciously aimed at refining and improving strategic goals.

Central to the decision process should be the question of "planning for what?" Table 1, for example, characterizes three horizons in the decision-maker's planning perspective, with broadness and inclusiveness increasing from 1 to 3 and certainty decreasing accordingly.

TABLE 1. DECISION-MAKER'S PLANNING PERSPECTIVE

Perspective	Approach	Activity
1. Technical	Static	Data assessment and aggregation; e.g., order of battle compilation.
2. Operational	Dynamic	Concept formation; e.g., scenario construction, applications utility analysis.
3. Strategic	Perceptual	Integration, "valuation" e.g., political/military projection.

Utility analysis of SBLs faces a challenge in fully capturing the synergy between SBL and other systems; its versatility at different levels and loci of operations; and its impact on theater as well as strategic conflict. A major complicating factor in projecting the very synergistic impacts of the SBL, for example, is that in order to do so, careful assumptions must be made about the development of the other systems with which it will function.

The imperfect understanding of SBL functions and benefits also creates an institutional problem. Issues exist concerning organizational relationships in which operational laser programs can be nurtured. The nature of such an organization

depends on the pace and goals of the program. Because of the complexity and seriousness of this question, efforts toward its resolution are warranted at this time.

A related issue is a programmatic choice now under some debate. According to some observers (Ref. 1) the DoD draft report has assumed hardening of Soviet systems that:

. . . tends to drive the U.S. to higher power levels and larger optical systems for chemical lasers in space . . . to provide a system capable of meeting the most severe Soviet challenge that can be expected as a counter once the U.S. demonstrates it can place a laser weapon in orbit.

One critic of the report claimed the study calls for "a perfect laser system, just as we have done in recent years seeking the perfect tank or the perfect bomber while the USSR went ahead and fielded lots of less-than-perfect tanks or bombers."

Instead of focussing on whether to be first or to be the best, the internal DoD debate should center on relative questions such as "how soon" and "how capable." Given the depth of potential U.S. problems in the strategic balance, the problems we may face in being second in space, and the uncertainties associated with maturing SBL technologies, the outside observer may be concerned that such a debate is irrelevant to critical U.S. strategic issues. In reality, the United States needs both to be first in space, and to be first with good systems.

2. STRATEGIC CONTEXT

It is not necessary to posit an explicit goal of a "war-winning," first-strike capability to note the Soviet pursuit of a wide-range of military advantages. These accumulating

advantages can lead to opportunities for new advantages and simultaneously can minimize the credibility of U.S. counter-responses at any stage of escalation.

As a result, the basic U.S. strategic interest for some time to come will be very defensive--to preclude any belief, perception or suspicion in the Kremlin that the United States can be attacked successfully, whatever "success" may mean. Because of the changing strategic picture, the potential contribution of SBLs to this mission may be far greater than particular detailed operational projections may imply at this time.

Due to an increasing strategic imbalance and shifts in strategic doctrine, the United States must necessarily focus on reducing Soviet confidence in their ability to execute a disarming or war-winning attack. Both Soviet doctrine and prudence dictate that a nuclear war should begin with sudden, massive strikes and be aimed first at the nerve centers of the enemy forces (i.e., C³I) and not at cities. The prime targets may well be U.S. satellites.

Space may be a key region for frustrating Soviet planning for central war. Even a weakly plausible defense of U.S. space assets may provide disproportionately large deterrent benefits. This notion is a product of the renewed interest in enduring U.S. capabilities in war. However, even analysts supporting reliance on almost minimum deterrent through assured destruction may be attracted by it because it helps to maintain the U.S. "minimum" by which to deter.

This contribution will be made in a context of shifting U.S. strategic doctrine, which appears to include new emphases on flexibility, surveillance and intelligence, hardened communications, deterrence based on counterthreat credibility, offense and defense interactively considered, initiative, the

multiplication of low-level escalatory options, increasing decision-time, enhancing survivability, and targeting the enemy's perceptions as well as his forces.

Given the thrust of this potential interest in concrete actions to undermine the utility of the potential aggressor's superior forces, earlier perspectives which have dominated U.S. thinking about space will have to be transcended. These earlier notions were (1) that space was an arena for peaceful scientific and humanistic development, in which military activity was not desirable, not very feasible, and subject to being banned in any event; (2) that space was a passive supplement to terrestrial political-military concerns serving, for example, as a vantage place for verification; and (3) that space was a potential and perhaps threatening arena of localized military operations between antisatellite weapons (ASATs) and civilian, surveillance, and C³ satellites.

These perspectives imply that space has little or limited active military utility. This view itself might be something of a self-fulfilling contradiction if held too seriously, especially if some other state does establish a visible military position in space. The impact then may be all the greater because of the disparity between the passive, skeptical view of the active military uses of space, and the results exploited by one's opponent. Surprise will be a shock, a concept of which Soviet planners are aware.

3. IMPACTS

It is important to note that "of forty artificial space bodies launched from earth in the first three years of the space age, only eight were Soviet, while thirty-two belonged to the United States. However, the Soviets were regarded throughout the world, including the United States, as being in the lead" (Ref. 2).

The very drama of a U.S. commitment to space today is likely to affect strategic relations immediately. The initial and potentially most important SBL impact may well be on national policies and global perceptions. SBL development could demonstrate technological capability and renewed U.S. determination against continued Soviet strategic ascendancy. The symbolic value of space alone could cause space initiatives to be perceived as more significant than efforts in better-known areas on earth, even if these perceptions are perhaps unfounded. Even certain space experiments may, like Sputnik, create a sense of national capability and world surprise without mounting a specific threat well beyond its specific, inherent capabilities.

More concretely, an operational SBL, even if restricted to space-to-space operations, is likely to affect the strategic balance. The ability to defend U.S. satellites against attacking satellites decreases the incentive to strike at otherwise "secure" strategic forces through attacks on their space-based support assets. Space-to-space operations are "strategic" if C³, navigation, and early warning capabilities are threatened.

Given potential SBL development, U.S. approaches to international discussions of space should be affected. To date, these approaches have sought the conclusion of negotiated agreements as a value per se, and have tried to create a body of legal and arms control doctrines for that purpose, as in the Outer Space Treaty and the Lunar Treaty. With a new strategic approach, negotiators should be more constrained in their responses to proposals which might inhibit the United States from redressing critical strategic problems. The United States is now not likely to allow its ability to take necessary measures, according to the right of self-defense, to be put under a legal cloud in these forums.

Some "stability" theorists believe that U.S. SBL development would only engender an offsetting Soviet SBL deployment. However, there does not seem to be any evidence that the Soviets would be incited to even greater efforts than those they are making now. Moreover, SBL development, experimentation, or deployment would take place in a context of strategic asymmetry which further undermines the implication that space deployment is inevitably symmetrical, mutually canceling, and therefore wasteful; even like systems deployed by opposing sides may serve asymmetrical purposes and have asymmetrical effects on perceptions of the balance. The United States in this period of a favorable strategic balance should be seeking systems which have differential effects in our favor, either due to the missions they can perform or because we may be able to do them better than the Soviets.

The use of space would reflect the strategy of the two sides, and we do not have to project reorientations of strategies to find an asymmetric U.S. ability to utilize SBL. That the Soviets have so assiduously pursued operational ASAT capability underscores this distinction between the two strategies. Even a passive defensive strategy, largely content to achieve a relatively static deterrent, would be compelled to evolve toward a new medium such as space in order to safeguard warning and verification.

A minimum aim of U.S. strategy, under pressure from the comprehensive Soviet build-up, would be to buttress the strategic deterrent by increasing the uncertainty of Soviet planners about the success--by any standard--of an attack on the United States. Conversely, the Soviet aim implied by ASAT experiments and the Soviet drive for superiority is to increase their certainty should they choose to attack. Ironically, supporters of mutual assured destruction would oppose the United States trying to lower its vulnerabilities, arguing that

this might increase the likelihood of nuclear war, in favor of maintaining the short-term viability of an increasingly unstable, offensively dominated deterrent.

It is not clear that the Soviets could automatically or easily develop forces or tactics to negate U.S. SBLs. Even if that were to happen, a minimum effect would be that U.S. SBLs would have forced the threat to reprogram itself. We need to explore the effect of a U.S. SBL on Soviet force and resource allocations and compare it to a status quo without a U.S. SBL; but it appears that uncertainty as a mission output, to be produced by the existence of a substantial SBL presence, may place unusually high demands on the offensive's cost-exchange calculations.

A perceptually attuned strategy does not require combat effectiveness projections of 100 percent. Even with reduced operational expectations, there still may be significant perceptual effects as recognized by a recent Defense Science Board study recommending the concept of a "threshold" defense for ABM. If uncertainty about outcomes of key scenarios is increased as the stakes get higher, then mission impacts will have been relatively large. The high stakes involved in strategic war almost certainly mean a lowered tolerance for uncertainty.

As uncertainty rises, distaste for even more difficult-to-predict actions should increase faster. Systematic psychological research has recently supported the common-sense notion of greater-than-linear aversion to risk with reductions in certainty (Ref. 3), given high stakes. This effect should be magnified when a close-to-certain outcome is required in order to make the risk worth the rewards of success.

Because the United States is a defensive-oriented power, even a "symmetric" uncertainty would likely be worse for Soviet aims. Key SBL evaluation criteria should be the marginal value

as well as the magnitude of that increased uncertainty, and alternative means of achieving it. Again, this argument should be especially compelling to theorists attracted by minimum deterrence and interested in maintaining the viability of that minimum level.

The functions that SBLs could perform are not new. While the large numbers associated with cost projections of SBL development and deployment may cool interest in SBLs, these should be compared with the costs of performing those functions without SBLs. Given the difference between the potentially "awesome" SBL impacts and the attempt to maintain some strategic balance without SBLs, the U.S. policy can have a no more important goal than to discourage the Soviet Union from "cashing in" on its strategic superiority in the 1980s and the 1990s. As the current MX debate implies, without SBL the costs of doing so effectively and safely may be truly astronomical; on the otherhand, SBL may turn out to be the economically, politically and militarily conservative option.

IV. SCENARIOS

1. SPACE-TO-SPACE SBL

a. Situation--The most important and plausible near-term SBL application is in space-to-space operations as an active satellite kill mechanism (e.g., ASAT). The space-to-space mission, to a large extent driven by nearest-term technology, appears also to be the most feasible SLB mission. First-generation SBLs (5 MW/4 m) are believed to be technically capable of successfully killing satellites currently in orbit. Later generation SBLs (10 MW/10 m and 25 MW/15 m) would be able to threaten even hardened satellite systems in a timely manner.

The importance of active space-to-space capabilities is increasing for the United States because, starting with the late 1980s, U.S. passive space assets such as reconnaissance satellites are likely to be the initial targets of any Soviet first strike and might well be targets of Soviet demonstration attacks in a crisis. The United States, therefore, must deny the plausibility of Soviet attacks on those targets.

While an almost totally reactive defensive capability might be desirable in theory, loss of initiative might place an insurmountable burden on limited hardening technology. While the SBL has the capability to strike targets at long ranges, it is itself vulnerable to such an attack and hence will become a prime, possibly time-urgent target for the other side. In addition, the demands of full coverage might be very expensive because the threat could come from many directions and in large numbers. "Initiative systems" which can choose their targets and be assigned defensive missions are likely to play a significant role in any strategically nonoffensive posture.

Therefore, policy as well as technology draws attention to tactical "dueling" in space. The apparently sequential nature of space operations, the operational versatility of

the underlying hardware, and especially the potential speed of operations if lasers are involved suggest that major emphasis be placed on how these operations are related and how they will interact, even though extremely concrete mission definitions may not yet be available.

b. Offensive posture--It is more difficult to explain U.S. interest in an offensively capable satellite than in a "defensive" weapon. The U.S. ASAT, while in general "offensive" in operation, may be able to undertake defensive missions. The foremost purpose of placing U.S. weapons in space is to reduce Soviet confidence in their first strike; for example, in their ability to blind U.S. space reconnaissance and to block strategic communications. A U.S. ASAT could contribute to this goal because defense in space may mean taking the initiative before we are actually fired upon.

A U.S. ASAT demonstration attack might be one which would try to deter attacks on U.S. assets or on third parties in space or on earth. Such a U.S. action could show a willingness to take the initiative and put the other side into a reactive mode. A demonstration attack in space would be an escalatory option in addition to what is now available, and would not necessarily risk any additional life or earth assets than those already endangered in a relevant crisis. Targets of a U.S. space demonstration attack could include potential ASATs and earth reconnaissance satellites used to achieve substantive as well as symbolic gains.

How the symbolic and substantive gains are associated in a demonstration or partial attack can be seen in a potential case. A Soviet incursion in the Southwest Asia area would probably be helped significantly by satellite C³I and large-area surveillance in general. The United States could execute a demonstration attack against a single Soviet communications

or an ocean-reconnaissance satellite, thereby underscoring its ability to damage Soviet intervention capabilities.

An attack on those Soviet space assets, perhaps with warning to maximize the deterrent value and to emphasize U.S. escalation control, could reduce Soviet interest in such an incursion. The overriding point of a demonstration attack, however, would be to communicate resolve, establish escalation dominance, and deter the Soviets from going further.

A partial attack would be aimed at a significant portion of Soviet space assets. Its goals, however, would still be limited and would attempt to deter further escalation by the enemy. Like the demonstration attack, it could be part of a limited war strategy, perhaps involving theater war or client states. It might well be aimed at operationally significant assets.

A partial attack by U.S. ASATs in anticipation of a strategic exchange could significantly reduce an opponent's confidence in any contemplated pre-emptive strike, at least by complicating the Soviet timing and attack coordination problem (for example, with respect to B-52 airfield and ICBM pin-down attacks). Unlike a demonstration attack, a partial attack would minimize warning and maximize speed. A partial attack would have symbolic benefits for strategic communication, like a demonstration attack, but given the serious stage of the hostilities and of the partial attack's targeting, the message communicated will be a close function of the operational achievement.

A full offensive attack in space might be a precursor to Single Integrated Operational Plan (SIOP) initiative, although it might help avoid SIOP by deterring further escalation. The SIOP might be preceded by some level of conflict, perhaps involving nuclear weapons, in the major theaters--Europe,

Southwest Asia, and Northeast Asia. The losing side in the theaters may be ready to escalate. Perhaps the first U.S. task would be to stop Soviet ASAT quickly, to destroy Soviet submarine C² space assets, and then to target Soviet space C³ and surveillance. The destruction of naval space assets, for example, might be particularly important in forestalling or at least seriously degrading Soviet naval warfare capabilities.

Demonstration, partial, and offensive space-to-space warfare are likely to be complicated by proliferated assets, passive protection, silent spares, and other defensive measures which will increase the challenge to initiating attack. These challenges are likely to loom larger as the stakes increase from demonstration to partial and then to pre-emptive attack.

c. Defensive posture--A defensive strategy in space that is only reactive to the other side's initiating attack may impose extraordinary demands on U.S. forces, especially if the means of attack involve practically instantaneous transmission of energy. Alternatives include complex architecture of proliferated systems to create the conditions for warning.

The focus of "defensive" scenarios differs between the pre- and post-SIOP periods. The character of space warfare is likely to change significantly following a SIOP exercise in a number of ways. Most space-based assets may be less critically important after SIOP initiation. Also, strikes on space-based assets are likely to be an integral part of an SIOP exchange. Furthermore, C² for SBL will probably be severely degraded by a SIOP exchange, and subsequent attacks will be of limited scope and effectiveness. U.S. and Soviet launch facilities are prime strategic targets. As long as the Soviets deploy the current ASAT system dependent on earth bases, surviving Soviet post-SIOP launch or C² capabilities will be negligible. Hence, post-SIOP space combat will depend on in-place systems. Should the Soviets deploy some form of on-station "space-mine"

or laser ASAT, the C² problem would still exist because of the continuing requirement for ground-based control.

The most likely Soviet threat will be some version of the current operational system consisting of a satellite interceptor deployed on a standard Soviet space booster. Other Soviet ASAT options for the next decade include co-orbiting mines, ground-based beam weapons, and possibly a Soviet SBL. Although Soviet ASATs are currently operational only in low orbits, it must be assumed that they will eventually achieve the ability to boost ASAT weapons to higher and even into geosynchronous orbits.

The SBL must be able to defend against a range of threats--from a massive Soviet strike against U.S. early warning and C³ assets to a selective strike on a critical system such as a reconnaissance satellite monitoring Soviet airlift activities in the Middle East to a Soviet demonstration or "shot-across-the-bow" attack intended to exert political leverage or elicit a particular U.S. response. In addition, an SBL must be able to defend itself.

The current U.S. retaliatory strategy places a great burden on C³I. The threat must be identified and action taken before the enemy ASAT has the opportunity to execute its mission. The criteria by which the U.S. will assess a Soviet space vehicle as a threat and choose to pre-empt depend both on policy and on operational considerations. The pre-eminent U.S. technology and well-founded, comprehensive development of policy before the threat occurs appear to be minimum requirements to maintain escalatory control and to set the tempo of events.

The presence of an explicit U.S. ASAT increases the investment the Soviets would have to make in initiating battle. Also, the presence of ASAT may imply that the United States could identify the conditions under which a satellite system

might fail and distinguish internal systems failures from external causes. This, too, may reduce Soviet incentives to attack U.S. satellites, compared to a condition in which it were assumed that no threat-warning ability exists. The ASAT itself will produce early warning of strategic attack, which can be the trigger to a U.S. retaliatory strike because the ASAT is likely to be the first target, thereby negating the original purpose of attacking U.S. strategic warning assets.

The problem of threat assessment and the requirement for pre-emption may necessitate that "keep-out zones" or kill distances be established and their existences made part of U.S. declaratory strategy. This would be difficult to achieve in heavily used orbits (e.g., geosynchronous orbits).

For other orbits, a defense zone may be more readily established since Soviet satellites would have no express need to occupy the same area. Such zones would also have to be cleared of non-U.S. pre-positioned vehicles in order to avoid the problem of space mines.

Current U.S. strategic doctrine places increased emphasis on survivability and protracted conflict capabilities. U.S. strategic and space policy (PD 37,58,59) calls for improved survivability of critical satellite assets. Most assessments of conflict in space emphasize the pre-SIOP period assuming that the importance of space will diminish in the post-SIOP period and that ground station and C³I assets will have been degraded. However, the growing importance of survivability and protracted capabilities argues for a requirement to operate in space, particularly during a building crisis/limited war, and to defend space-based assets over time. Although the Soviets are not known to have an enduring space warfare capability, it is possible that they will attempt to develop such a capability in the future as part of their warfighting, war-winning posture. Hence, it is important to view SBLs as

playing an extended role and as buttressing the long-term survivability of U.S. space-based assets.

A protracted conflict in space could arise from a theater-level conflict or even a limited strategic exchange. Initial targets for a Soviet attack would be those space assets directly supporting the terrestrial battle. A second target set would be those assets which would contribute to subsequent stages in the conflict. For example, the Soviet Union might seek to attack U.S./NATO space-based C³ prior to or during a theater conflict. Subsequently, Moscow might attempt to eliminate U.S. navigation assets in the hope of blunting any anticipated U.S. limited nuclear attack on Soviet/Warsaw Pact territory. A third stage in the escalation of conflict in space could involve strikes on early warning assets preparatory to a strategic attack.

The ability to defend space-based assets, either with SBL alone or with a combination of passive and active defenses, could further protract the space and earth conflicts. While U.S. "defenses" may prohibit the Soviet Union from achieving pre-emption, over the course of a limited conflict the Soviets may perceive a continuing requirement to degrade U.S. operations in space. Thus, a protracted conflict in space may involve a series of attacks against particular sets of target satellite systems, following attacks on other more strategically oriented systems. The time frame involved with protracted space warfare could therefore be on the order of days or even weeks.

d. ASAT engagement phase--An attempt to erase or to temporarily neutralize Soviet tactical C³ satellite systems may be a high priority in regional operations. Before U.S. forces are committed to ground/naval operations in the selected battle area, it will be advantageous to degrade Soviet reconnaissance and target acquisition capabilities. Space-based HELs can be promptly employed in this role against Soviet RORSAT and EORSAT.

Once Soviet satellite targets are defined, the sequence of engagement can be established within the overall structure of operations. Soviet RORSAT and EORSAT may not be pre-emptive targets, especially if tacit agreement exists to refrain initially from ASAT engagements.

2. SBL IN A STRATEGIC CONFLICT: THE BMD SCENARIO

a. Situation--One of the most significant potential missions for SBL systems is the BMD role. Assuming that the technical problems can be overcome, the SBL offers some distinct and potentially decisive advantages over existing forms of BMD, most notably the ability to intercept ballistic vehicles in the boost phase of their trajectories. This offers the prospect for a significant damage limitation capability, something heretofore viewed as virtually impossible to obtain due to the inherent limitations on ground-based BMD systems. However, a BMD mission is impossible with the 5/4 system and only a limited capability would exist with the 10/10. For this reason and because of the stress placed on sensors and engagement computers, a SBL in a BMD mode is likely to be a very long-term prospect. For other less stressful missions (i.e., silo, airbase, C³ defense), it is also unclear whether SBL would be the initial BMD system of choice.

A BMD system based on SBLs could involve as many as 100 battle stations deployed in an interlocking net to provide the maximum coverage by as many stations as possible. Such a system would also provide a major ASAT and air defense capability. The creation of a space-based BMD is likely to be a prolonged process; the costs involved make it unlikely that such a system could be deployed swiftly. The nature of the BMD problem is such that the proposed system will not be very effective until a substantial fraction of the total system is deployed. While it will be possible to build on earlier deployments--for example, SBLs for air defense--much of the

BMD system will have to be created de novo. The resulting uncertainties raise issues of timing.

The characteristics of BMD scenarios depend not only on the defensive systems deployed, but also on the offensive threat and offensive responses to defenses. The difference between an LNO, counterforce, and full RISOP attack is likely to be at least one of magnitude. Also, the types of launchers used and location of launching sites could vary accordingly. A counterforce attack would consist primarily of SS-18 and SS-19 ICBMs with the remainder of the force withheld for later use. A theater attack would use a combination of MR-IRBMs and ICBMs, perhaps up to 1000 in all.

Three types of offensive responses to strategic defenses are possible: (1) proliferated re-entry vehicles (RVs), (2) passive counters, and (3) active counters. The first is seen in a classic defense-offense race in which the offense aims to overwhelm or exhaust the defender. In the second, the offense seeks to evade or negate the defense by such means as shielding of RVs, by maneuvering, or by using decoys. The use of active counters aims directly at the destruction of the defensive system. While RV proliferation is the conceptually simplest form of antidefense countermeasure, it is potentially the most expensive and subject to nullification through additional defensive deployments. Passive or active counters also have problems, in principle. While they complicate the operation of the defense, they exact a price on the offense which reduces or may even negate the possibility of a successful attack. For an attacker highly sensitive to uncertainty, given equal investments by both sides, any combination of offensive countermeasures may not replenish the certainty degraded by the deployment of defensive systems, for practical purposes.

The sequencing of an attack and the duration of a conflict will markedly affect the character of the scenario and the

requirements for SBL BMD. Typical BMD scenarios focus on a Soviet massive pre-emptive strike targeted on U.S. strategic forces and C³ assets accompanied by efforts to degrade early warning capabilities. Another and potentially equally stressful situation involves a prolonged conflict, perhaps escalating from conventional warfare to theater nuclear warfare, and then to strategic warfare. A protracted conflict would be fought over a period of weeks, if not months, and would involve the use of secure reserves (either sea-based or land-based). In addition, over a protracted period, the focus of offensive action could shift from theater strikes to attacks on CONUS-based military assets--particularly mobilization assets--to general countervalue options. In a protracted scenario, the Soviet Union could focus attention on degrading U.S. space-based capabilities, particularly SBLs, in anticipation of escalation to strategic nuclear war. The growing importance of space for passive and active military missions makes it an increasingly likely arena for superpower conflict. The deployment of SBLs, particularly for support of tactical operations, poses the danger of quick escalation from regional to space/strategic conflict. Thus, U.S. SBLs may come under attack well in advance of any strikes on CONUS or NATO.

Three scenario variants may be significant for examination. The first involves pre-emptive strikes against CONUS-based strategic forces and support capabilities. The second is a counter-other military targets (OMT)/countervalue/counter-population attack, possibly protracted. The third is a theater nuclear engagement with the possibility of some limited strikes against NATO support functions located in CONUS (i.e., MATS, ports, communications). It is assumed that one aspect of each of these scenarios is an ASAT/DSAT mission. In addition, it is likely that the Soviet response to any BMD capability would

involve some attempts to counter the SBL system directly. Delineation of this mission will come in the space scenario.

b. Defense of strategic forces--A counterforce strike against U.S. strategic forces will attempt to gain the maximum advantage from surprise and decision cycle prior to U.S. response. Depending on the availability of real-time reconnaissance and retargeting, the attack may involve several waves, second and subsequent waves either restriking all critical targets or compensating for failures in the first wave. Coordination of strikes will be a particularly difficult problem; it is possible that a Soviet strike would involve a precursor wave of SLBMs intended to prevent the successful escape of U.S. bombers or launch-under-attack of ICBMs. The threat will involve from one to several thousand boosters and many times that many RVs. In the absence of the SBL, a Soviet counterforce attack will make maximum use of the SS-19 force. The balance of their attack will likely use less capable systems targeted on softer or more segregated support assets [i.e., C³, submarine ports, SAC refueling bases, the National Command Authority (NCA)]. It is also possible that Soviet bombers will be used subsequent to the missile strikes to provide cross-targeting of critical, non-time-urgent assets. The projected attack profile will be of high intensity and of short duration.

The requirements placed on a SBL BMD system depend on the character of the ground-based ICBM and air-breathing legs of the Triad. In the absence of passive protection measures (e.g., mobility, deceptive basing, dispersal, or hardening) or active defenses [Low-Altitude Defense (LoAD) and exoatmospheric intercept], the entirety of the BMD mission could fall on the SBL. Even then, the BMD system can complicate the offense's calculations by creating the possibility of a system

of preferential defense rather than minimal coverage of all strategic forces. Selective protection for particular missile wings might severely complicate a Soviet second strike. Additionally, the SBL could provide a significant degree of protection against a Soviet pindown of SLBM barrage along bomber fly-out corridors. SBL can serve as a mobile BMD mission, protecting dispersed strategic assets. Selective defense could exact a severe penalty on the attacker--the offense is forced to use up a greater number of boosters, probably those (SS-17, SS-11) not optimized for the counterforce mission. SBL would also give to a greater number freedom to mix offensive and defensive assets in the event that a combination of LoAD-exoatmospheric defense and deceptive basing is the primary defense of the ICBMs. In combination with other defensive systems, even a marginally effective, high-leakage SBL system could insure the survival of a large number of U.S. ICBMs.

However, the likelihood is that both passive and active defenses will be emplaced. This allows the SBL system to operate as an overlay to a multilayered defense capability. In particular, selective targeting of Soviet SS-18s and SS-19s would limit the requirements on the SBL system for total coverage while also reducing the stress on the other elements of the defense.

The Soviet Union would have difficulty responding to such defensive deployments. One set of responses to a U.S. effort to defend its strategic forces would involve either proliferation of RVs or increasing the number of boosters, or both. The first alternative does not appear particularly attractive against a boost-phase defense. The second option, particularly if each booster carries one or only a few RVs, is inherently beneficial to the defense. Additionally, efforts to "spoof" the defense by launching an attack intended to draw out the

defenses and pinpoint location of the ICBMs for strikes by counterforce weapons would be more difficult, if not impossible, with the SBL. So would plans for retargeting of follow-on attacks; the possibility for selective defense with SBL reduces the ability of the attacker to retarget successfully.

One aspect of a Soviet counterforce strike will undoubtedly be to destroy critical support functions. The loss of such assets could seriously degrade U.S. retaliatory capabilities. Moreover, the movement towards active defense of ICBMs may push the Soviets towards increasing their strikes on support function, in the expectation of disrupting or paralyzing any retaliatory response. Nevertheless, existing defenses would be less effective in protecting strategic support functions than in the ICBM-defense role. Additional layers of defensive weapons, particularly defenses such as the SBL which can be switched to cover targets in immediate peril, should reduce the probabilities of successfully destroying the strategic infrastructure. The SBL would also provide significant protection for other strategic assets, many of which are relatively soft or immobile and hence more vulnerable than ICBMs or bombers because the inherent area coverage provided by the SBLs allows coverage of separated assets.

SBLs in defense of U.S. strategic forces can reduce if not eliminate the "use it or lose it" problem. If SBLs (and other defenses) can preserve a portion of the bomber bases, it would be possible to recycle elements of the B-52 force. Currently, the air-breathing component of the Triad is the most vulnerable to the "use or lose" problem. SBLs, however, would permit the United States to extend its time horizons beyond the immediate period of an attack. Withholding becomes an increasingly viable option.

Additionally, defense of support assets could enable the United States to undertake a graduated response strategy. Protected C³I is the most critical precondition for a war-fighting or denial strategy. Unlike ground-based defenses which inherently signal the presence of a potential target, the SBL provides a means of distant defense without acting as a telltale.

c. Defense of OMT/countervalue/counterpopulation--Although Soviet strategy emphasizes the decisiveness of the initial counterforce phase of a strategic conflict, strikes against OMT, industry, C³ and administration, and even population are contemplated. Such strikes might occur concomitantly to counterforce strikes or as part of a staged campaign intended to eliminate U.S. war-fighting capabilities as well as the bases of national power. Soviet strategy recognizes that for a variety of reasons a strategic conflict could become protracted. Hence, there is a requirement for an extended war capability which would target mobilized industry, reconstituted military forces, and even population, if necessary. U.S. intrawar national mobilization would provide additional targets and the requirement for extending defenses over time.

The problem for the strategic defense is one of attack duration as well as attack intensity. The SBL may therefore offer a greater prospect of damage limitation than mobile-based BMD, because wider coverage is clearly available through an SBL BMD. To the extent that critical target sets are protected through a system of dispersal, hardening, or redundancy, the problem for the defense will be eased. However, in many cases the nature of the target sets precludes passive measures, thereby placing a heavier burden on active defenses. Among these target sets are transportation, energy, some basic industries such as aluminum refining, and military logistical supply centers and mobilization bases. As noted above, the process of nationwide industrial and military mobilization will

create additional targets; many of these new targets will be extremely vulnerable. SBL can provide an overarching shield which could limit an attacker's ability or at least his expectation of being able to inhibit or destroy the U.S. mobilization potential.

A nationwide BMD capability also provides the operational underpinning for a strategy of war survival. With SBLs, nationwide civil defense and industrial protection become viable, if not mandatory. While total defense is probably impossible, the combination of active and passive defensive measures offers the prospect for limiting damage and casualties such that the other side may well be deterred. Current estimates suggest that the United States could lower potential casualties to between several and twenty million with a comprehensive civil defense program. Addition of a nationwide BMD capability could further reduce these casualties to at worst a few million, according to some estimates. Additionally, dedicated defense of particularly vulnerable regions, especially the Northeast corridor, the industrial Midwest and the Southwest, could provide the solution to population dispersal difficulties.

The SBL offers a protracted defense capability. For a variety of reasons, it is possible that a nuclear engagement might become protracted. To destroy an opponent's national power requires repeated strikes, according to Soviet strategy. Additional strikes may also be required as military forces are mobilized and industry is reconstituted. Also, population may become a target; Soviet strategy may seek to strike a dispersed population or to wait until shelters are left. A protracted conflict may therefore insure involving either selective or massive strikes over an extended period. SBL provides an enduring defensive capability, independent of the immediate need for resupply, movement, or retargeting which

can protect CONUS against the protracted threat. SBL increases the credibility of a damage of denial strategy by promising a measure of protection over an extended period. An SBL BMD capability also offers the prospect for postwar deterrence and defense; it is a defensive, secure strategic reserve, similar to the offensive reserves now envisioned as a part of U.S. strategic systems.

d. Defense in a theater conflict--For the past thirty years, the U.S. strategic deterrent has been extended to shield U.S. allies from the threat of nuclear attack. The coupling of strategic and theater nuclear forces is intended to insure Soviet recognition that, in the event of a theater conflict, the potential exists for escalation to direct U.S.-Soviet homeland exchanges. However, escalation from theater to strategic conflict may not be immediate or total; a central war may be preceded by some undefined period of theater-only nuclear strikes, or even by a series of limited strikes against facilities supporting the theater conflict located in CONUS and the Soviet homeland. A nationwide BMD system would reduce Moscow's incentive to escalate against CONUS targets, thereby limiting a prospective conflict to a theater-level exchange.

Because of the time and space problem, a theater nuclear engagement poses a particularly serious problem for the anti-tactical ballistic missile (ATBM) system. In Europe, NATO faces an improved threat composed of SS-11 ICBMs and obsolete SS-4 and 5 IR/MRBMs, as well as the new MIRVed SS-20s. Soviet doctrine and strategy calls for massive nuclear strikes on NATO theater nuclear assets, C³, transportation and logistics, and political-administrative centers. Although it is generally believed that the Soviets will seek to limit collateral damage, both as a means of ensuring the survivability of valuable industrial assets and of reducing the problems for advancing Soviet forces, recent studies have suggested that the Soviet

Union might use some theater weapons against urban-industrial targets to panic the population and perhaps precipitate political collapse. Any defense is faced with an extremely intense threat, over a short period of time, against a small and densely populated target area.

The critical problems for BMD in this situation are reaction time and multiple-kill capability. The threat is likely to be extremely intense over a very brief time. The SBLs would have difficulty providing preferential defense of extremely critical targets, and this problem is more severe if a general area BMD capability is sought. Defensive coverage could be improved to the extent that the SBL system was able to selectively eliminate the likely counterforce weapon, the SS-20. Population protection will require high impenetrability; because of population densities and space restrictions, civil defenses in the NATO area are likely to involve, at best, minimum in-place sheltering.

Critical NATO assets are relatively few in number and highly vulnerable. Strikes against cantonments, casernes, airbases, ports and C³ could swiftly paralyze NATO's response capability. This places a high premium on pre-emption. The SBL in tandem with some form of ground-based ATBM could provide an overlay/underlay defense that would offer some prospect of improvement in the short-term survivability of NATO assets. Furthermore, the antiair warfare capability of an SBL offers additional prospects for attriting and even pre-empting strike aircraft. Since NATO also faces a high-intensity threat from Soviet/Warsaw Pact strategic and technical aircraft, this is a significant potential defense. However, in view of the time-target problem in Europe, it is unlikely that any BMD, including one based on SBL, could offer a serious damage-limiting capability. Critical assets can be made more survivable if preferentially defended and hardened, but only at a high cost.

V. CONCLUSIONS: SBL AND THE FUTURE POLITICAL-STRATEGIC CONTEXT

To date, space has had a significant, sometimes revolutionary, impact on the political-strategic context. The ability to exploit space has served important military and political functions. The Soviet investment in Sputnik garnered incalculable political-strategic returns: the Soviet Union was able to mask its real strategic weakness and to pursue an aggressive foreign policy to which the United States was hard-pressed to respond. The linkage between perceptions of the strategic balance and reality was not reestablished until 1962. The placement of objects in space, the development of manned orbiting stations, and moon landings have all continued to have a direct and lasting influence on worldwide perceptions of national scientific and military capabilities--and recent events such as the reaction to the U.S. Space Shuttle suggest this will continue.

Space-based capabilities currently serve a number of critical military functions such as reconnaissance and verification, C³, and navigation. Yet, current assessments of strategic power are calculated virtually exclusively in terms of earth-based assets. Interest in using space for military purposes has generally been coincident with but subordinated to requirements of earth-based military assets. Although there is a certain awareness of the potential political-strategic significance of space, reflected particularly in the Outer Space, ABM, and Test Ban Treaties, that medium remains generally undefined and poorly understood with respect to any more active or extensive military uses.

The ability to deploy SBLs and the likelihood of such deployments by either side will be a function of the previous uses of space. Attainment of entry into space creates status

in the world community and the ability to use space demonstrates the technological, scientific and military prowess of a nation. The increasing support functions played by space-based assets also makes space a potential region for offensive action in order to deny one's opponent those capabilities. The Space Shuttle, the Voyager missions, general Soviet space missions, and the Soviet manned orbital station program have all tended to focus more attention on space.

A growing awareness of the military and technological implications of space-based capabilities may thus make that medium an increasingly attractive arena for political-strategic activities. Offensive uses of space have the potential for significantly shaping and altering both strategic or regional military balances and global perceptions as well. Successful deployment of the SBL would probably produce a dynamic shift in the political-strategic balance.

Although there is a tendency when discussing changes in force posture and weapon deployments to compress the time frame involved, it is important to remember that the period from conceptual design or planning analysis to actual deployment is inevitably lengthy. The time frame for the SBL is especially long; even initial deployments are not foreseen before the end of the decade, assuming that technical feasibility is proven. The time horizon for SBL deployments requires a concerted long-term investment starting now, if the fruits of the investment are to be realized this century. In this regard, the decision to undertake development of SBL, regardless of the specific mission it is eventually assigned, will in itself influence the environment in which SBL will be deployed. What is significant about the SBL is that its development and eventual deployment could serve as a positive statement that the United States intends to set the terms of future strategic competition; it would be the result of U.S. near-term efforts

to influence actively the character of the political-strategic balance and to direct its evolution, rather than merely respond to more time-urgent issues as they arrive.

Active SBL development now would constitute a commitment to and an investment in the future. The United States successfully achieved a positive military balance in the early 1960s through such a large-scale investment in strategic forces, including the first deployments of SLBMs, of silo-based ICBMs, and later of multiple RVs, each of which set the agenda for the strategic competition. That investment has been the essential element of U.S. national security for the past two decades. The accomplishments of that period permitted the United States to freeze its strategic force posture in 1967 and to tolerate a long-term Soviet buildup which eventually resulted in a condition of parity between the two superpowers. We have, in a sense, lived off the accumulated capital of that earlier period; however, that stock is now virtually exhausted. The trends in the strategic balance, once viewed as tolerable due to the retention of absolute, then technological, U.S. superiority are now increasingly intolerable. One may argue that the United States should lay the groundwork now for a future strategic balance.

As in the early 1960s, the United States must seize the opportunity to redefine the character of the strategic competition and the nature of the military balance. Today, the United States is faced with a strategic posture of declining wartime utility and a strategic doctrine which presents decision-makers with the choice of surrender or mutual annihilation. Recent U.S. strategic theory, with its emphasis on the disutility of strategic forces, the dangers of the arms race, and the criticality of an assured destruction strategy to crisis stability is incredible. Predictions concerning moderation of Soviet behavior, influenced by the ethnocentric

bias of U.S. strategic concepts, have clearly been in error. The prediction that technological determinism would drive both sides towards a doctrinal and policy convergence has also not been realized. Over the past decade, however, insistence on equating stability with a static balance has produced a built-in resistance to systems, and the defense of the U.S. SBL offers not only the prospect for combating the negative trends in the strategic competition, but also the opportunity to redefine the character of the strategic balance, the parameters of deterrence, and the prospects for the use of U.S. strategic power.

A redefinition of the character of the strategic balance depends on an appreciation of the offense-defense duality. Only in the past twenty-five years has the offense been given absolute primacy and the very concept of defense been so neglected. Although offensive technologies and forces may dominate a battlefield for a brief moment, it is the unalterable lesson of history that offensive pre-eminence is eventually, and often after only a brief hiatus, offset by the evolution of defensive capabilities. Nor can the issue of offense-defense interaction be limited strictly to competing technologies. While science may favor one pole, strategy and operational art may serve the other. Furthermore, not all technologies are unambiguously offensive or defensive. SBL maintains the capability to perform both offensive and defensive missions. While some SBL deployments can be characterized as performing a particular mission due to numbers of satellites, orbital locations or power and beam characteristics, this will not always be the case. And the United States cannot be sure that an opponent will obtain the correct measurement of U.S. intentions. The balance, such as it can ever exist between conceptual and functional opposites, is inevitably fluid.

Acceptance of an offense-defense interaction and the utility of defensive systems fundamentally contradicts the offense-biased, assured destruction orientation of recent U.S. strategic policy. The arms control lobby has consistently opposed defensive systems as dangerously destabilizing because they threaten the success of a retaliatory deterrent. These same advocates of assured destruction have also argued that existing force levels are too high and that deterrence could be maintained at lower levels of forces (some have seriously contended that as few as ten arriving weapons would cause sufficiently intolerable damage so as to preserve deterrence). What has been clearly omitted from the arms control position is the idea that defenses might buttress deterrence by preserving a retaliatory capability. Furthermore, alternative balanced offensive/defensive force postures could constitute a more effective deterrent in view of Soviet strategic concepts than could be achieved through an offensive posture alone. Defensive systems also focus attention on attack conditions in the event deterrence fails; defenses do offer the prospect of increased war survivability.

Defensive systems in general, and the SBL in particular, are being opposed on the grounds that:

- (1) They threaten to produce an arms race.
- (2) Such systems increase the likelihood of war by reducing the credibility of assured destruction.
- (3) They can be countervailed by Soviet responses which will prove more damaging than the current strategic imbalance.
- (4) The Soviet Union will not permit the deployment of defenses or other systems which they perceive as offering the U.S. a strategic advantage.

In response, it is important to note that arms competition in itself does not inherently produce crises destabilization nor is it always openly provocative. Indeed, under conditions of strategic imbalance, an arms race may improve stability. As noted above, strategic balances are inevitably dynamic and arms competition can provide dynamic stability. On the second point, it is impossible to ascertain the real stability in crises of the existing force posture. It can be argued with equal force that the ability to threaten nuclear war with some prospect of national survival is an equal or better deterrent. If ten delivered weapons deter, then under most circumstances no defense imaginable would reduce the value of the U.S. and Soviet arsenals. However, defenses may deter by denying the possibility of victory to opponents who believe it may be a definable and obtainable goal.

Quite rightly, any deployment of the SBL must be undertaken with a keen awareness of possible responses by the Soviet Union and others. Soviet reactions would depend on the then-existing state of the strategic balance, Soviet defensive capabilities, and Soviet technology. If SBL deployment were to follow increased investment by the United States in other defensive system elements, notably LoADs and/or an exoatmospheric BMD component, the Soviet response might well be different than if the United States moved directly to a space-only capability rather than seeking a multilayered defensive posture. There is a possibility that the Soviet Union would seek to match U.S. efforts and to acquire the means to achieve active military uses of space, regardless of the actual utility of such a capability to them.

Failing to exceed or even match the United States in space, the Soviet Union could seek to limit the United States capability via negotiation. Soviet interest in arms control related to space is certain to increase as the United States approaches

a demonstration capability. Such efforts to limit the military use of space could find strong support in traditional U.S. strategic theory which is profoundly negative in its view of the implications of strategic technologies in general, and defensive systems in particular. However, as noted above, the prospect of Soviet responses to SBL should not in itself preclude the deployment of a U.S. system.

Should the Soviet Union choose to respond to U.S. defensive deployments the United States will be faced with an interactive situation and the potential for an arms race in space. Rather than viewing such a potential situation as inherently destabilizing, the United States might seek to control future arms competition in directions which are compatible with both U.S. and Soviet security concerns. While an unconstrained arms competition is generally undesirable, a defensive race, especially one based on negotiated agreements between the competitors, may be far less threatening to U.S. interests and positions during crises. The 1972 ABM Treaty provides one possible means of initiating a negotiated basis for defensive deployments. Revisions to the Treaty permitting deployment of an effective BMD system could serve to stabilize the process of change in the strategic balance and in the relationship between offensive and defensive capabilities. Additionally, in the SALT context, a negotiated basis for deployment of defensive systems could help to preserve existing limits on offensive systems, and perhaps even encourage further SALT negotiations.

With or without a negotiated agreement, the timing of defensive deployments will be of critical importance. Simply stated, there are good times and bad times to initiate defensive deployments or to expand an existing capability. In the midst of a U.S.-Soviet crisis would seem a poor time. Conversely, in a period of relative quiescence, such deployments

may seem far less threatening. Scale of deployments is also important. The simultaneous launch of a full 50 or 98 SBL stations without warning or preparation could actually raise serious concerns about the possibility of pre-emptive military action.

Avoidance of the appearance of "breakout" for the purpose of strategic surprise may be important to the management of the political and strategic uncertainty created by such deployments. While strategic uncertainty may be desirable, political uncertainty is provocative. Attention must be devoted to U.S. declaratory policy, both as it applies to the timing and scale of defensive deployments and also as it serves to signal commitment and intention. In the absence of adequate preparation, misperception of U.S. motives is likely to occur.

It has been suggested that the deployment of even a single SBL station would precipitate a crisis in which the Soviet Union attempts to destroy the U.S. satellite rather than tolerate any potential change in the strategic balance. This fear results from the assumption that the balance today, in fact, is relatively stable and that any U.S. strategic initiatives, particularly if they threaten to complicate Soviet targeting, are so destabilizing as to require an immediate, pre-emptive, and provocative response. It is unclear why the Soviet Union, which has never held to the U.S. notion of mutual assured destruction, would view a threat to that strategy as in itself destabilizing. Nor is it clear why this latest turn in the cycle of arms competition, which has continued--at least on the part of the Soviet Union--throughout the period of SALT and detente, should spark a nuclear conflict.

Arms competitions are rarely even the proximate causes of conflict. The U.S.-Soviet strategic relationship has been maintained despite, or perhaps because of, a continuous arms competition and intense political-strategic rivalry. Historically,

introduction of new and potentially destabilizing technologies have not led to war, even when those new developments were clearly more threatening than the SBL. The development of Minuteman, Polaris, MIRV, the Soviet fourth-generation ICBMs, Galosh and Safeguard ABM systems, and ASAT have conspicuously failed to provoke a conflict despite many dire predictions. If assured destruction--as characterized by its advocates--works at all, then in pressing the limits of the strategic competition, there should be relatively little incentive for either side to resort to conflict initiation, even if there is a risk that a particular nascent deployment might, at some future point, threaten static measures of stability or inhibit a nation's war-fighting potential. Because of the extreme risk in any superpower confrontation, both sides have shown themselves willing to tolerate high levels of strategic ambiguity. Thus, it is unlikely that the initial deployment of SBL would, other things remaining unchanged, result in a direct military conflict with the Soviet Union.

The strategic balance remains dynamic rather than static. Attempts to manufacture a static balance, stable only in the sense that both sides accept mutual vulnerability as a central strategic principle and the attendant force posture, have failed. The combination of dynamic technologies, asymmetrical strategic doctrines and postures, conflicting national objectives and interests, and operational and perceptual distinctions among elites have resulted in a military balance that is resistant to being frozen. The SBL viewed in this context is not a potential source of instability as its detractors claim.

Change already is perceptible. The United States is about to exploit the Space Shuttle, capable of placing large payloads in orbit at significant cost savings, to carry a number of military payloads. Advanced sensor technologies are being developed for deployment in the mid to late 1980s capable of

tracking tactical aircraft from synchronous orbit. Both the United States and Soviet Union are actively developing anti-satellite weapons and a variety of BMD technologies. Space thus promises both to be an area of increasing military-strategic initiative and to exert a growing impact on the balance of earth-bound forces.

As space takes on an increasing prominence in military strategy and force postures, conflict in space becomes both increasingly likely and more significant. Space will constitute a vital arena, not necessarily of secondary importance to earth-based capabilities. As both sides have more space assets, conflict there will become more intense and more difficult to manage. The threat of collateral damage to a nation's own assets will restrict the kinds of weapons used in space (i.e., nuclear bombs) as well as the scale of space conflict.

The change is inevitable. The United States is faced with the difficult choice of either apprehending the character and direction of the revolution into space and directing that change towards ends consonant with U.S. national security, or having the environment change suddenly and uncontrollably and being thrust into an uncertain, highly volatile and potentially threatening future. We must begin to think about these issues now, even though deployment of SBL is years away. As noted at the beginning of the paper, the potential of the SBL is awesome. The tasks of analyzing the potential utility of SBL and the political-strategic impacts are equally awesome, but also necessary.

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